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**TECHNICAL OPERATIONS SUPPORT
(TOPS)**

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**MATERIALS AND MANUFACTURING DIRECTORATE
AIR FORCE RESEARCH LABORATORY
AIR FORCE MATERIEL COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OH 45433-7750**



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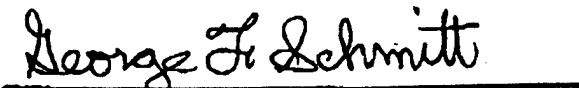
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13. ABSTRACT (Maximum 200 Words) The purpose of this contract was to provide the Materials and Manufacturing Directorate with the capability to acquire short-term research and development (R&D) and systems support efforts not readily available either in-house or under existing contracts. To facilitate the management of the program, all tasks were grouped into six categories: analyses, assessments, technical consultants, technology transition and transfer, strategic studies and workshops.				
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1.0 Program Description

The Technical Operations Program Support (TOPS) program was a task order contract with a 5 year period of performance. The contract was awarded in August 1994. The purpose of the contract was to provide the Materials Directorate with the capability to acquire short-term research and development (R&D) and systems support efforts not readily available either in-house or under existing contracts. To facilitate the management of the program all tasks were grouped into six categories: analyses, assessments, technical consultants, technology transition and transfer, strategic studies, and workshops.

2.0 Primary Objectives

The Materials Directorate is charged with the responsibility for planning and executing the USAF exploratory development and advanced development programs, as well as providing systems support for materials and processes. The primary objective of the TOPS program was to provide support to the Materials Directorate to ensure quality and timely solutions to current aerospace and materials problems. This was done through:

- assessment of customer requirements and Air Force and DoD policy/guidance
- analysis of technology opportunities to meet these requirements
- organizing and supporting workshops and seminars to keep ML scientists current with state-of-the art technology and to bring together experts for program planning
- analysis and assessment of plans to develop new materials and processes
- analysis and assessment of the progress of in-house and contractual programs
- conducting sustaining engineering analyses and assessments of Air Force operational and maintenance problems/technology needs and development of sustainability plans and strategies
- and through technology transition and transfer efforts.

Technical analyses and assessments were used in evaluating current in-house progress and to supplement inputs for major and minor program direction decisions. Specific tasks were all of a short-term nature and varied in scope depending on area complexity and magnitude.

Technical analyses were of two types: experimental and theoretical. Experimental analyses involved hands-on activity in support of specimen testing and materials characterization. This included supplies and equipment for conducting directorate analyses; preparation and testing of specimens; usage of subcontractor facilities for specialized equipment needs; and development of compositional failure and life prediction analyses of engineering materials for aerospace applications. Theoretical analyses basically involved the development and expansion of mathematical equations and hypotheses relating to the real world, and typically involved computer algorithmic formulations, as versus laboratory development.

Assessments concerned the study, evaluation and deliberation of ongoing and projected Directorate technical programs and of technology areas in general. They were used to provide guidance for steering future technology investments by the Materials Directorate. These tasks relied on the contractor's technical opinion based upon information provided by the Government or the contractor, rather than on the strict observation of phenomena based on irrefutable and reproducible measurement. These assessments provided information to the Directorate management to establish priority technologies for flexible responses to Air Force technical needs and for guiding investment strategy policy. The assessments concerned both projected Air Force systems and the operational and maintenance deficiencies with existing systems.

Technical Consultants were used to provide specialized state-of-the-art advice in support of research and development initiatives. Sometimes these experts from industry provided assessments of Air Force problems/needs, such as identification of Aging Aircraft problems, and in other cases they provided advice on the plans prepared to address some of these needs. Other consultants were used to provide guidance and assistance to various Air Force research initiatives.

Technology Transition and Transfer task efforts were done to obtain recognition and acceptance of ML developed technologies by AF and DoD contractors and to conduct technology transfer of ML developed technologies to commercial applications. Activities included the preparation of ML Success Stories, displays, brochures, viewgraphs, and other marketing/advocacy documents.

Strategic Studies were performed on Air Force technology needs and opportunities, changes in higher level policy and guidance, the political climate and organizational restructuring needs. Databases were developed to capture information generated, to enable the Directorate management to review areas of strategic importance to the Directorate and to consider strategic priorities. Recommendations were made on strategic directions for research in the Materials Directorate.

Workshops, symposia and seminars were used primarily to keep Directorate personnel abreast of the latest scientific advances and to motivate and guide in-house research. Lectures typically involved presentations to the Directorate by university professors and experts/consultants from industry working in concomitant technical areas. These lectures enabled the Directorate to explore areas of mutual interest that might exist between Directorate scientists and researchers from outside sources. Workshops were

used to bring together industrial, academic and Government engineers and managers for exploring technical areas in depth. These workshops often involved large audiences and were often held at suitable sites throughout the country. Typically at these workshops, presentations of technical papers of recent findings and research were presented to promote the exchange and discussion of information and ideas. Both lectures and workshops were instruments for guiding Directorate policy in technology directions for current and projected weapons systems.

3.0 Executive Summary

A total of 31 tasks and 134 subtasks were performed under this contract. A total of 61 subcontractors were used in performance of the subtasks. Appendix A displays the time line of performance for the program tasks. Appendix B identifies the subtasks and performers. 8 of the tasks involved technical analyses, 4 of the tasks were for technical assessments, 3 tasks provided technical consultants, 5 tasks were for technology transition/transfer, 4 tasks supported strategic studies, 2 tasks provided sustaining engineering support, and 3 tasks provided program management and 2 tasks provided workshops/lectures/seminars.

4.0 Funding

This task order contract was awarded 16 August 1994 with a ceiling of \$9,197,973. There were three modifications to this contract. P00024 on 28 September 1995 established CAAS authority. On 14 March 1996, the contract was modified through P00036 to increase the ceiling by \$3,500,000. This modification also established a 3400 fund cite for this program. On 4 February 1997, P00052 modified the contract by increasing the ceiling another \$6,383,904. The total contract value through these

modifications was \$19,080,877. Funding actually received on the contract totaled \$12,659,982.

Funding was allocated over 31 tasks, which are included in Task Final Report Summaries. The tasks and funding are as follows:

T/O 001 Program Management	\$119,630
T/O 002 ML Technology Transition and Transfer	327,635
T/O 003 InP Material/Device Study	58,232
T/O 004 ML Strategic Studies	411,385
T/O 005 Cancelled	
T/O 006 Technical Analyses	419,000
T/O 007 Assessments	406,000
T/O 008 Lectures and Workshops	876
T/O 009 Technical Consultations	344,350
T/O 010 Computational Modeling	74,663
T/O 011 WUD #26 PEER Review	14,000
T/O 012 Laser Ablation Process Assessment	100,000
T/O 013 CVI of CMC Turbine Rotor	102,772
T/O 014 Technical Analyses	929,522
T/O 015 Assessments	714,629
T/O 016 Program Management	140,000
T/O 017 ML Tech. Transition and Transfer	442,000
T/O 018 ML Strategic Studies	187,000
T/O 019 Technical Consultations	401,850
T/O 020 Sustaining Engineering	242,200
T/O 021 CAAS Sustaining Engineering	272,300
T/O 022 Technical Analyses	694,400
T/O 023 Assessments	639,550
T/O 024 Technical Consultations	697,096
T/O 025 ML Strategic Studies	329,050
T/O 026 Program Management	305,275
T/O 027 ML Tech. Transition and Transfer	576,776
T/O 028 Technical Analyses & Consultation	921,800
T/O 029 Assessments	336,915
T/O 030 ML Strategic Studies	834,176
T/O 031 Information Collection and Dissemination	450,000
T/O 033 ML Tech. Transition and Transfer	1,166,900

These 31 tasks covered 8 basic areas. These areas and funding are as follows:

Program Management (3)	\$ 564,905
Technical Analyses (8)	3,300,389
Technical Assessments (4)	2,097,094
Technology Transition/Transfer (5)	2,963,311
Strategic Studies (4)	1,761,611
Technical Consultants (3)	1,443,296
Sustaining Engineering (2)	514,500
Lectures/Workshops (2)	14,876

5.0 Task Final Report Summaries

This section contains Task Final Report Summaries. For each of the 31 tasks on the program, a one page summary has been prepared, which identified the period of performance, the funding and expenditures, the number of subtasks under that task, the objective, a list of the largest subtasks, and a summary of the type of work done under the task to meet the objective.

Task Final Report Summary

TASK ORDER: 001- Program Management

START: 16 Aug 1994

END: 15 Oct 1995

FUNDING (with transfers): \$119,630

EXPENDITURES: \$119,426

NUMBER OF SUBTASKS: 0

OBJECTIVE: To provide for those program activities necessary to establish task orders and conduct program management and administration over the entire program.

LARGEST SUBTASKS: N/A

SUMMARY: Anteon performed administrative and financial management functions, such as: scheduling of activities and milestones; describing status of each task order; outlining contractor activity and progress toward accomplishment of objectives; planning, forecasting and making recommendations on funding and funding changes; program planning; summarizing the overall conduct and results of each task; and documenting any new technology breakthroughs. During this task, 15 new tasks were initiated, that involved over 50 subtasks. Anteon provided the administrative support to get these subtasks on contract and monitored each task until completion.

Task Final Report Summary

TASK ORDER: 002 – ML Technology Transition and Transfer

START: 16 Aug 1994

END: 15 Dec 1995

FUNDING (with transfers): \$327,635

EXPENDITURES: \$323,683

NUMBER OF SUBTASKS: 2

OBJECTIVE: To provide a vehicle for ML developed technologies to be recognized, accepted and transitioned to DoD contractors and transferred to the commercial sector.

LARGEST SUBTASKS:

- a. 002-1 Technology Information Center – Anteon, \$290,483
- b. 002-2 WL/FI Technology Transition – Anteon, \$33,200

SUMMARY: Under this task, Anteon provided technology transition and transfer activities to the Materials Directorate and to the Air Vehicles Directorate's Structures Division. Activities included preparation of Success Stories, viewgraphs, brochures, and other promotional documents. Annual brochures were prepared that identified completed contracts, active contracts, and new starts within the Directorate. Displays were developed for hallways within the Directorate and for use at technical symposia.

Task Final Report Summary

TASK ORDER: 003 – Indium Phosphide Materials/Devices Correlation Study

START: 15 Sep 1994

END: 15 Dec 1995

FUNDING (with transfers): \$58,232

EXPENDITURES: \$58,005

NUMBER OF SUBTASKS: 0

OBJECTIVE: To analyze and characterize Indium Phosphide (InP) based semiconductor materials and devices and to provide correlation between growth conditions, materials properties and device performance.

LARGEST SUBTASKS: N/A

SUMMARY: 25 InP wafers purchased from Crystacomm were supplied by the government to the subcontractor Allied Signal. Allied Signal performed the testing and electronic materials characterization requested by the government and correlated these results with optical characterization performed by AFRL/MLPO.

Task Final Report Summary

TASK ORDER: 004 – ML Strategic Studies

START: 6 Oct 1994

END: 15 Dec 1995

FUNDING (with transfers): \$411,385

EXPENDITURES: \$406,801

NUMBER OF SUBTASKS: 6

OBJECTIVE: To perform studies on AF customers technology needs and opportunities for technology breakthroughs, changes in political climates, and organizational restructuring needs and to provide analyses to Materials directorate management for their use in deciding strategic directions for research and reorganization in ML, while considering political implications.

LARGEST SUBTASKS:

- a. 004-2/4 Identify elements and implementation plan for management decisions (database) - Anteon, \$91,000
- b. 004-1 Establish & weigh ML objectives, goals, and decision criteria and determine constraints and metrics – IBX, \$295,000
- c. 004-3 2-day workshop on Strategic Planning Strategy – QLSI, \$5,600
- d. 004-5 Generate & compile data for mathematical algorithm for appraisal system – Jim Brink, \$15,000

SUMMARY: The subtasks here provided important support to the Materials and Manufacturing Directorate's planning and strategic planning processes. IBX helped the Directorate analyze key elements that became rating criteria for a program evaluation process for the ML Buy Plan. QLSI in another activity helped the Directorate run a 2-day workshop that developed a strategic planning strategy for the Directorate. A final activity involved a mathematical algorithm that was needed to help implement a new appraisal system within the Directorate.

Task Final Report Summary

TASK ORDER: 005 – Ceramic Fiber Coating Consultations

START: Cancelled

END:

FUNDING (with transfers):

EXPENDITURES:

NUMBER OF SUBTASKS:

OBJECTIVE:

LARGEST SUBTASKS:

SUMMARY:

Task Final Report Summary

TASK ORDER: 006 – Technical Analyses

START: 27 Dec 1994

END: 30 Nov 1996

FUNDING (with transfers): \$419,000

EXPENDITURES: \$417,665

NUMBER OF SUBTASKS: 8

OBJECTIVE: To provide technical analyses of current materials and processes to develop and support all AF systems. Technical analysis were to be performed in three materials and processes (M&P) technology thrust areas:

1. M&P for Structures: Propulsion and Subsystems
2. M&P for Electronics, Optics and Survivability
3. M&P for Systems and Operational Support

LARGEST SUBTASKS:

- a. 006-4 Technical Analysis of Non-equilibrium Coating Technology – Anteon w subs, \$212,000
- b. 006-3 Equal Channel Angular Extrusion – Texas A&M, \$70,000
- c. 006-1 Low Energy Configuration Computer Models of PFPAE Fluids and Effective Additives – Allied Signal, \$33,000
- d. 006-6 Technical Analysis of Mechanical Response Data – Dr. D.I.G. Jones, \$25,500

SUMMARY: Several analyses were conducted under this task. One such effort involved the study of interactions of PFPAE based fluids and soluble additives with metal surfaces. Changes in the structures of additives and differences in molecular weight were investigated. Variations were modeled to understand experimental differences observed. Another subtask investigated the workability of two ingot metallurgy, high temperature alloys – a near-gamma titanium aluminide alloy and a nickel-based superalloy. Process variables, such as preheat temperature, ram speed, and back pressure on recrystallization, flow localization, and shear failure were determined. A third subtask developed and applied classical molecular dynamics software for the DoD laser hardened materials science program.

Task Final Report Summary

TASK ORDER: 007 - Assessments

START: 1 Dec 1994

END: 30 Nov 1995

FUNDING (with transfers): \$406,000

EXPENDITURES: \$400,162

NUMBER OF SUBTASKS: 6

OBJECTIVE: To provide assessment of on-going and projected technical programs and technology areas, to assist the guiding of ML investment strategy policy, and to study policy for current and projected AF weapon systems.

LARGEST SUBTASKS:

- a. 007-3 Medical Applications for Composites – Dr. Roger von Hanwehr and Bill Watt, \$95,000
- b. 007-4 Assessment of Strategic Plan for Structures Technology – Robert Bader, Jan Garrison and Larry Kelly, \$150,000
- c. 007-2 Identification of Candidate Components for Low Cost Induction Heating Process – Boeing, \$70,000
- d. 007-1 MLBC Technical Assessment - Anteon, \$36,000

SUMMARY: In one of these subtasks, Boeing identified several candidate aircraft component part configurations for the demonstration of Induction Heating Process for affordable composite structures. Major focus of the components was for F-22, V-22, and JAST/ASTOVL. Another example subtask was to assess the needs, benefits and mechanism for providing existing and/or new composite material properties and performance data for spacecraft structures within the aerospace industry.

Task Final Report Summary

TASK ORDER: 008 – Lectures, Workshops and Seminars

START: 13 Feb 1995

END: 13 Feb 1996

FUNDING (with transfers): \$876

EXPENDITURES: \$865

NUMBER OF SUBTASKS: 0

OBJECTIVE: To provide for those program activities necessary to establish task orders and conduct program management and administration over the entire program.

LARGEST SUBTASKS: N/A

SUMMARY: No lectures, workshops or seminars were ever activated under this task.

Task Final Report Summary

TASK ORDER: 009 – Technical Consultations

START: 27 Dec 1994

END: 29 Mar 1996

FUNDING (with transfers): \$344,350

EXPENDITURES: \$337,514

NUMBER OF SUBTASKS: 6

OBJECTIVE: To provide state of the art advice and consultation in support of AF technology and to provide quick response access to experts for short term analyses and assessments in the execution of technology initiatives and programs.

LARGEST SUBTASKS:

- a. 009-2 Technical Consultation for the Installation of Composite Repairs on Metal Structures – Bud Westerman, \$119,000
- b. 009-4 Organic Synthesis of NLO – Active Pyridinium Chromophores – Dr. Ram Kannan, \$43,000
- c. 009-5 Measurement of Cryogenic IR Indices for Thin-Film Materials – Dr. Tom Leonard, \$23,000

SUMMARY: This task required the participation of nationally recognized experts, visiting scientists, and other authoritative representatives of private industry and academia. Experts involved in these subtasks included:

Dr. Paras Prasad
Bud Westerman
Dr. Girish Patil
Dr. Tom Leonard
Dr. Linda Detterman.

Task Final Report Summary

TASK ORDER: 010 – Computational Modeling of Fluorohalocarbon Materials

START: 2 Jan 1995 **END:** 29 Dec 1995

FUNDING (with transfers): \$74,663

EXPENDITURES: \$70,574

NUMBER OF SUBTASKS: 0

OBJECTIVE: To conduct analysis to computationally predict physical and chemical properties of various fluorohalocarbon and fluoroalkylether compounds.

LARGEST SUBTASKS: N/A

SUMMARY: Equilibrium and non-equilibrium molecular dynamics simulations of a variety of fluorohalocarbon and fluoroalkylether compounds were conducted using the Discover module of the Biosym Molecular Modeling program. Ab initio molecular orbital calculations were done, as needed in order to obtain additional data. Resulting data was used to obtain physical and chemical properties of the subject compounds using additional software.

Task Final Report Summary

TASK ORDER: 011 – WUD #26 PEER Review

START: 7 Nov 1994

END: 7 Mar 1995

FUNDING (with transfers): \$14,000

EXPENDITURES: \$13,749

NUMBER OF SUBTASKS: 0

OBJECTIVE: To perform independent peer review workshop of Materials Directorate in-house research and development program conducted under Work Unit Directive (WUD) Number 26.

LARGEST SUBTASKS: N/A

SUMMARY: Anteon conducted a 2-day workshop at ML. Five individuals with extensive knowledge and experience in the area of laser hardened materials were chosen to conduct a review of the laser hardened materials research program. Four of these individuals were from universities and industry and the fifth individual was a government person. These individuals reviewed the current and projected program and submitted a formal evaluation of the program to the Materials and Manufacturing Directorate's Chief Scientist and to the WUD #26 Leader.

Task Final Report Summary

TASK ORDER: 012 – Laser Ablation Process: Plume Physics

START: 13 Jan 1995 **END:** 13 Jan 1996

FUNDING (with transfers): \$100,000 **EXPENDITURES:** \$98,030

NUMBER OF SUBTASKS: 0

OBJECTIVE: To conduct modeling of various nonstructural materials to predict the characteristics of plasmas formed during pulsed laser deposition.

LARGEST SUBTASKS: N/A

SUMMARY: The contractor conducted studies on laser ablation of carbon. Modeling was performed that included absorption of laser energy by molecular excitation. Several parameters were investigated and reported. In addition, the contractor modeled MoS₂ ablation by 248 nm laser light. Again modeling was performed that included absorption of laser energy by molecular excitation. The reaction of Mo, S, and MoS₂ atoms/molecules, as a consequence of collision in the gas phase, were accounted for in the model's computations. Several parameters were investigated and reported.

Task Final Report Summary

TASK ORDER: 013 - Chemical Vapor Infiltration (CVI) of Ceramic Matrix Composite (CMC) Turbine Rotor

START: 13 Feb 1995 **END:** 30 Nov 1995

FUNDING (with transfers): \$100,772

EXPENDITURES: \$102,772

NUMBER OF SUBTASKS: 0

OBJECTIVE: To analyze a new manufacturing technology process called forced flow CVI as compared to isothermal CVI as the process for making the rotor. Forced Flow CV has the potential of greatly simplifying the design of the CMC turbine rotor over the higher risk isothermal CVI process.

LARGEST SUBTASKS: N/A

SUMMARY: The contractor analyzed the forced flow infiltration CVI process by fabricating two CMC panels, one with coated fibers and one without coated fibers. The contractor then fabricated two CMC turbine rotor disks using 11K tow T-300 carbon fiber reinforced with silicon carbide. One disk was to investigate flow parameters. The second disk was delivered to the government for evaluation. The fiber architecture was a 2-D plain weave cloth laid up in a 0/+/- 60 orientation.

Task Final Report Summary

TASK ORDER: 014 – Technical Analyses

START: 28 Jul 1995 **END:** 29 Aug 1997

FUNDING (with transfers): \$929,522

EXPENDITURES: \$920,409

NUMBER OF SUBTASKS: 13

OBJECTIVE: To provide technical analyses of current materials and processes to develop and support all AF systems. Technical analysis were to be performed in three materials and processes (M&P) technology thrust areas:

1. M&P for Structures: Propulsion and Subsystems
2. M&P for Electronics, Optics and Survivability
3. M&P for Systems and Operational Support

LARGEST SUBTASKS:

- a. 014-10 Titanium Alloy Billet Thermomechanical Processing – General Electric, \$255,000
- b. 014-1 Technical Analysis of Laser Cleaning of Oxygen Lines – Dr. Craig Walters, \$215,000
- c. 014-11 Powders for Coatings – METSS, \$150,000
- d. 014-6 Modeling of various nonstructural materials to predict the characteristics of plasmas formed during Pulsed Laser Deposition – Physical Sciences, Inc., \$100,000
- e. 014-5 Analysis of Fastener Hole Processing – Rockwell Science Center, \$75,000

SUMMARY: In the largest of these tasks, titanium billet processing schedules and resulting microstructures were identified to provide optimal final part mechanical properties and to maximize inspectability. Process variables were defined to refine prior beta grain size, brake-up colony alphas structure, and avoid strain-induced porosity. Another example subtasks performed under this task include the analysis of fastener hole processing. In this subtask, fastener holes in Al7075-T6 that had been processed to achieve fine grain structure were analyzed. The analyses included exfoliation corrosion and corrosion fatigue life. These were compared to fastener holes that had not been processed. Additional analyses included corrosion/fatigue testing and incorporated metallographic and fractographic analysis, with attention to fatigue crack initiation sites. Other subtasks included such as efforts as “Rutherford Backscattering of Ion Implanted Silicon Carbide,” “High Velocity Thermal Spray,” and “Optimization of Powders for Large Area Powder Coating.”

Task Final Report Summary

TASK ORDER: 015 - Assessments

START: 28 July 1995

END: 31 May 1997

FUNDING (with transfers): \$714,629

EXPENDITURES: \$700,656

NUMBER OF SUBTASKS: 10

OBJECTIVE: To provide assessment of on-going and projected technical programs and technology areas, to assist the guiding of ML investment strategy policy, and to study policy for current and projected AF weapon systems.

LARGEST SUBTASKS:

- a. 015-2 Strategic Plan for Aging Systems – Robert Bader, \$200,000
- b. 015-6 Strategic Plan for the Space and Missile Program – Anteon, \$135,000
- c. 015-1 Technical Assessment of the Strategic Plan for Structures Technology for JSF – Larry Kelly, \$155,000
- d. 015-3 Technical Assessment of the Strategic Plan for Structures Technology – Jan Garrison, \$68,000

SUMMARY: Three of the largest subtasks involved strategic planning support to the Structures Division of the Air Vehicles Directorate. Specifically, the looked at aging systems, the JSF aircraft, and the interactions with on-going and planned activities of NASA, FAA, the U.S. Army, ARPA, industry, academia and other U.S. Air Force organizations. The fourth subtask involved assessment of the Strategic Plan for Space and Missiles in the Materials Directorate. The assessment considered both the technical direction, as well as, business aspects of the program. Government and industry reviews were attended and technical analyses and investment strategies were provided to the Air Force.

Task Final Report Summary

TASK ORDER: 016 - Program Management

START: 16 Oct 1995

END: 30 Mar 1997

FUNDING (with transfers): \$140,000

EXPENDITURES: \$137,242

NUMBER OF SUBTASKS: 0

OBJECTIVE: To provide for those program activities necessary to establish task orders and conduct program management and administration over the entire program.

LARGEST SUBTASKS: N/A

SUMMARY: Anteon performed administrative and financial management functions, such as: scheduling of activities and milestones; describing status of each task order; outlining contractor activity and progress toward accomplishment of objectives; planning, forecasting and making recommendations on funding and funding changes; program planning; summarizing the overall conduct and results of each task; and documenting any new technology breakthroughs. During this task, 10 new tasks were initiated, that involved 49 subtasks. Anteon provided the administrative support to get these subtasks on contract and monitored each task until completion.

Task Final Report Summary

TASK ORDER: 017 – ML Technology Transition and Transfer

START: 11 Dec 1995

END: 10 Dec 1996

FUNDING (with transfers): \$442,000

EXPENDITURES: \$441,024

NUMBER OF SUBTASKS: 4

OBJECTIVE: To provide a vehicle for ML developed technologies to be recognized, accepted and transitioned to DoD contractors and transferred to the commercial sector.

LARGEST SUBTASKS:

- a. 017-1 ML Technology Transfer – Anteon, \$275,000
- b. 017-3 AFRL/ML Multi-Media CD-ROM Presentation – Paradigm, \$100,000
- c. 017-2 WL/FIBA Technology Transfer – Anteon, \$60,000
- d. 017-4 WL/FIVE Brochure – Anteon, \$3,000

SUMMARY: Under this task, Anteon provided technology transition and transfer activities to the Materials Directorate and to the Air Vehicles Directorate's Structures Division. Activities included preparation of Success Stories, viewgraphs, brochures, and other promotional documents. Annual brochures were prepared that identified completed contracts, active contracts, and new starts within the Directorate. Displays were developed for hallways within the Directorate and for use at technical symposia. A CD ROM was also prepared that described the technical divisions within ML, included information on facilities, included success stories, and included all technical research papers written by Directorate personnel from 1990 to 1996.

Task Final Report Summary

TASK ORDER: 018 – ML STRATEGIC STUDIES

START: 11 Dec 1995

END: 10 Dec 1996

FUNDING (with transfers): \$187,000

EXPENDITURES: \$184,788

NUMBER OF SUBTASKS: 3

OBJECTIVE: To perform studies on AF customers technology needs and opportunities for technology breakthroughs, changes in political climates, and organizational restructuring needs and to provide analyses to Materials Directorate management for their use in deciding strategic directions for research and reorganization in ML, while considering political implications.

LARGEST SUBTASKS:

- a. 018-1 Requirements Analysis – Anteon \$123,000
- b. 018-2 AFRL/ML Integrated Data Base – Anteon, \$48,000
- c. 018-3 AFRL/XP Integrated Data Base – Anteon, \$13,000

SUMMARY: This task order provided information and databases for sorting this information for use by AFRL/ML and AFRL/XP in strategic planning. For AFRL, Air Force customer requirements (Mission Area Plans and Technology Integrated Product Team Technical Needs, Center Technology Council Needs, etc.) and various Air Force and DoD planning documents (AF 2020, Spacecast 2020, Vision 2010, etc.) were analyzed and implications, needs assessment, and priorities were provided to AFRL/ML. A database was established that enables AFRL/ML to track individual programs and investments by key strategic factors. For AFRL/XP a financial database was developed that enables AFRL/XP to also sort investments by key areas.

Task Final Report Summary

TASK ORDER: 019 – Technical Consultations

START: 13 Nov 1995

END: 29 Aug 1997

FUNDING (with transfers): \$401,850

EXPENDITURES: \$400,881

NUMBER OF SUBTASKS: 11

OBJECTIVE: To provide state of the art advice and consultation in support of AF technology and to provide quick response access to experts for short term analyses and assessments in the execution of technology initiatives and programs.

LARGEST SUBTASKS:

- a. 019-1 Characterization of Organic Compounds for Nonlinear Optical Properties – Dr. Paras Prasad (SUNY Buffalo), \$300,000
- b. 019-2 Aging Systems Technical Consultation – Dr. Walter Reimann, \$65,000
- c. 019-3 Research on Shear-Induced Bond Scission and Molecular Thinning – Dr. Dadras, Dr. Spikes, and Dr. Palmer, \$28,000

SUMMARY: This task required the participation of nationally recognized experts, visiting scientists, and other authoritative representatives of private industry and academia. Experts involved in these subtasks included:

- Dr. Paras Prasad
- Dr. Walter Reimann
- Dr. Parviz Dadras
- Dr. Hugh Spikes
- Dr. Richard Palmer
- Dr. Dennis Nagle
- Dr. Kshore Pochiraju
- Prof. James Kolodzey
- Dr. So Dow Cehm
- Dr. Kalyanaraman Mohan
- Dr. Randall Feenstra
- Mr. Jeffrey Smith

Task Final Report Summary

TASK ORDER: 020 – Sustaining Engineering

START: 8 Apr 1996

END: 15 Aug 1999

FUNDING (with transfers): \$242,200 (3400)

EXPENDITURES: \$241,919

NUMBER OF SUBTASKS: 1

OBJECTIVE: To provide assistance in executing ML's operational and maintenance mission activities in the area of Materials and Processes for Sustainability. Typical efforts in Sustainment Engineering include resolution of supportability deficiencies, mishap-safety investigations, impaired performance evaluation, failure analyses, feasibility studies and efforts responsive to EPA compliance efforts.

LARGEST SUBTASKS:

a. 020-1 Coatings Technology Integration Office – Anteon, \$225,000

SUMMARY: Under this task Anteon provided support to the Coatings Technology Integration Office. This office has the responsibility to evaluate new coating systems prior to introduction into the operational fleet. Coatings related problems being experienced by field organizations were analyzed and assessment of approaches to resolve the issues was made. The ability of existing, environmentally friendly materials and processes to meet performance requirements of aircraft paint and de-paint operations were evaluated. In addition corrosion problems on Air Force systems were detected and documented. Approaches to minimize the impact of corrosion and extend the service life on Air Force systems were identified.

Task Final Report Summary

TASK ORDER: 021 – CAAS Sustaining Engineering

START: 11 June 1996

END: 6 July 1999

FUNDING (with transfers): \$272,300 (3400) **EXPENDITURES:** \$271,476

NUMBER OF SUBTASKS: 4

OBJECTIVE: To provide assistance in executing ML's operational and maintenance mission activities in the area of Materials and Processes for Sustainability. Typical efforts in Sustainment Engineering include resolution of supportability deficiencies, mishap-safety investigations, impaired performance evaluation, failure analyses, feasibility studies and efforts responsive to EPA compliance efforts.

LARGEST SUBTASKS:

- a. 021-3 Coatings Technology Integration Office – Anteon and AdTech, \$161,000
- b. 021-1 MLS Environmental Technology Support – Anteon, \$79,000
- c. 021-2 Corrosion Prevention, Assessment, and Control – Anteon, \$27,000

SUMMARY: Under this task Anteon provided support to the Coatings Technology Integration Office. This office has the responsibility to evaluate new coating systems prior to introduction into the operational fleet. Coatings related problems being experienced by field organizations were analyzed and assessment of approaches to resolve the issues was made. The ability of existing, environmentally friendly materials and processes to meet performance requirements of aircraft paint and de-paint operations were evaluated. In addition corrosion problems on Air Force systems were detected and documented. Approaches to minimize the impact of corrosion and extend the service life on Air Force systems were identified. Anteon assisted in the assessment of the National Materials Advisory Boards report "Aging of U.S. Air Force Aircraft." Plans for corrosion prevention, assessment, and control were put together and roadmaps were developed.

Task Final Report Summary

TASK ORDER: 022 – Technical Analyses

START: 1 Oct 1996

END: 30 June 1998

FUNDING (with transfers): \$694,400

EXPENDITURES: \$682,629

NUMBER OF SUBTASKS: 7

OBJECTIVE: To provide technical analyses of current materials and processes to develop and support all AF systems. Technical analysis were to be performed in three materials and processes (M&P) technology thrust areas:

1. M&P for Structures: Propulsion and Subsystems
2. M&P for Electronics, Optics and Survivability
3. M&P for Systems and Operational Support

LARGEST SUBTASKS:

- a. 022-4 Low Observable (LO) Advanced Performance Coating Development and Demonstration – BBM Technology, \$230,000
- b. 022-1 Laser Cleaning of Oxygen Lines – Craig Walters Associates, \$225,000
- c. 022-5 High Velocity Thermal Spray – University of Mississippi, \$159,000
- d. 022-6 Integrated p-OWIP and LED Arrays for Optical Upconversion, Institute for Microstructural Sciences, \$30,000
- e. 022-2 On-site support to in-house computational analysis and modeling program – Tabitha Uwimpuhwe, \$25,000

SUMMARY: The first of these subtasks involved the development and validation of an environmentally compliant aircraft coating with significantly improved performance. The coating system was required to have reduced volatile organic compounds. Evaluation, optimization, and demonstration were done with selective resins, pigments, and additives to achieve more durable/cleanable coatings. The last subtask, listed above, provided for on-site support. This researcher extracted data from quantum mechanical calculations and entered data into spreadsheets. The data was manipulated to gain information on the vibrational modes of halon-like molecules.

Task Final Report Summary

TASK ORDER: 023 - Assessments

START: 1 Oct 1996

END: 30 Sep 1998

FUNDING (with transfers): \$639,550

EXPENDITURES: \$\$635,955

NUMBER OF SUBTASKS: 6

OBJECTIVE: To provide assessment of on-going and projected technical programs and technology areas, to assist the guiding of ML investment strategy policy, and to study policy for current and projected AF weapon systems.

LARGEST SUBTASKS:

- a. 023-3 Technical Assessment of the Strategic Plan for Structures Technology - Aging Systems – Robert Bader, \$195,000
- b. 023-1 Strategic Plan for the Space and Missile Program Area – Anteon, \$185,000
- c. 023-2 Technical Assessment of the Strategic Plan for Structures Technology – JSF – Larry Kelly, \$185,000
- d. 023-4 Technical Assessment of the Strategic Plan for Structures Technology – Jan Garrison, \$50,000

SUMMARY: Three of the largest subtasks involved strategic planning support to the Structures Division of the Air Vehicles Directorate. Specifically, the looked at aging systems, the JSF aircraft, and the interactions with on-going and planned activities of NASA, FAA, the U.S. Army, ARPA, industry, academia and other U.S. Air Force organizations. The fourth subtask involved assessment of the Strategic Plan for Space and Missiles in the Materials Directorate. The assessment considered both the technical direction, as well as, business aspects of the program. Government and industry reviews were attended and technical analyses and investment strategies were provided to the Air Force.

Task Final Report Summary

TASK ORDER: 024 – Technical Consultations

START: 1 Oct 1996

END: 30 Jun 1998

FUNDING (with transfers): \$697,096

EXPENDITURES: \$697,096

NUMBER OF SUBTASKS: 8

OBJECTIVE: To provide state of the art advice and consultation in support of AF technology and to provide quick response access to experts for short term analyses and assessments in the execution of technology initiatives and programs.

LARGEST SUBTASKS:

- a. 024-1 2nd and 3rd Order NLO Materials – Dr. Paras Prasad (SUNY Buffalo), \$300,000
- b. 024-1a 2-Photon-Absorption-Induced, Low Energy Addition Polymerization – Dr. Paras Prasad (SUNY Buffalo), \$200,000
- c. 024-3 Off-axis Laser Effects – John McCullum, \$130,000

SUMMARY: This task required the participation of nationally recognized experts, visiting scientists, and other authoritative representatives of private industry and academia. Experts involved in these subtasks included:

- Dr. Paras Prasad
- Dr. Partha Paul
- Mr. John McCullum
- Dr. Shelby Thames
- Dr. H. Bernard Schlegel
- Dr. Valeri Vabushok
- Dr. Phillip Westmoreland
- Dr. Thanh Truong
- Mr. George Peterson
- Mr. Peter Haaland
- Mr. Paul Marshall
- Dr. Walter Reimann

Task Final Report Summary

TASK ORDER: 025 – ML Strategic Studies

START: 9 Dec 1997 **END:** 31 Mar 1998

FUNDING (with transfers): \$329,050

EXPENDITURES: \$326,423

NUMBER OF SUBTASKS: 4

OBJECTIVE: To perform studies on AF customers technology needs and opportunities for technology breakthroughs, changes in political climates, and organizational restructuring needs and to provide analyses to Materials directorate management for their use in deciding strategic directions for research and reorganization in ML, while considering political implications.

LARGEST SUBTASKS:

- a. 025-0 ML Strategic Studies, \$185,000
- b. 025-1 AFRL/MLO Integrated Data Base – Anteon, \$90,000
- c. 025-3 Vision 21 – Anteon, \$43,000
- d. 025-2 AFRL/FM Integrated Data Base –Anteon, \$8,000

SUMMARY: The largest subtask provided technical support to “Strategic Planning for 21st Century Laboratories and Test and Evaluation Centers of the DoD.” Data was collected to enable the DoD to plan for reduction, restructuring, and revitalization of DoD laboratories and test and evaluation centers. The other activities involved continued development of databases for MLO and FM to track contractual investments.

Task Final Report Summary

TASK ORDER: 026 - Program Management

START: 1 Apr 1997

END: 16 Aug 1999

FUNDING (with transfers): \$305,275

EXPENDITURES: \$303,963

NUMBER OF SUBTASKS: 0

OBJECTIVE: To provide for those program activities necessary to establish task orders and conduct program management and administration over the entire program.

LARGEST SUBTASKS: N/A

SUMMARY: Anteon performed administrative and financial management functions, such as: scheduling of activities and milestones; describing status of each task order; outlining contractor activity and progress toward accomplishment of objectives; planning, forecasting and making recommendations on funding and funding changes; program planning; summarizing the overall conduct and results of each task; and documenting any new technology breakthroughs. During this task, 5 new tasks were initiated, that involved 31 subtasks. Anteon provided the administrative support to get these subtasks on contract and monitored each task until completion.

Task Final Report Summary

TASK ORDER: 027 – ML Technology Transition and Transfer

START: 10 Dec 1996

END: 31 Mar 1998

FUNDING (with transfers): \$576,776

EXPENDITURES: \$573,210

NUMBER OF SUBTASKS: 6

OBJECTIVE: To provide a vehicle for ML developed technologies to be recognized, accepted and transitioned to DoD contractors and transferred to the commercial sector.

LARGEST SUBTASKS:

- a. 027-0 ML Technology Transfer – Anteon, \$350,000
- b. 027-3 MLLP Technology Transfer – Anteon, \$80,000
- c. 027-1 WL/FIBA Technology Transfer – Anteon, \$57,000
- d. 027-2 MLS Technology Transfer – Anteon, \$57,000
- e. 027-5 WL Technology Transition and Transfer – Anteon, \$14,000

SUMMARY: Under this task, Anteon provided technology transition and transfer activities to the Materials Directorate and to the Air Vehicles Directorate's Structures Division. Activities for MLS involved preparation of viewgraphs and displays as needed for promotional efforts. For MLLP a Communications Plan was prepared and numerous displays were developed. Support was provided to the AFRL Public Affairs office to further implement technology transition on a broader level. Other efforts were also provided to AFRL to continue the successful technology transition activities that originated in ML.

Task Final Report Summary

TASK ORDER: 028 – Technical Analyses and Consultations

START: 12 Dec 1997

END: 15 Aug 1999

FUNDING (with transfers): \$921,800

EXPENDITURES: \$865,158

NUMBER OF SUBTASKS: 9

OBJECTIVE: To provide technical analyses of current materials and processes to develop and support all AF systems. Technical analysis were to be performed in three materials and processes (M&P) technology thrust areas:

1. M&P for Structures: Propulsion and Subsystems
2. M&P for Electronics, Optics and Survivability
3. M&P for Systems and Operational Support

LARGEST SUBTASKS:

- a. 028-4 Characterization of Second and Third-Order NLO Materials – Dr. Paras Prasad (SUNY Buffalo), \$450,000
- b. 028-9 Modeling for Sol-Gel Surface Treatment and Investigation of Hybrid Sol-Gel Formulations – Battelle, \$120,000
- c. 028-1 Aging Systems Technical Consultation – Dr. Walter Reimann, \$12,000
- d. 028-5 Integrated p-OWIP and LED Arrays for Optical Upconversion – Institute for Microstructural Sciences, \$50,000

SUMMARY: The largest of these subtasks involved characterization of second and third-order NLO materials. The contractor evaluated materials provided by the government. The materials were evaluated for potential applications of electro-optic modulation at 830 nm, optical power limiting at 800 nm, and florescent imaging of paint. Evaluation techniques included were UV and visible solutin spectroscopy, Degenerate Four Wave Mixing, Electric Field Induced Second Kerr Gate, and Optical Power Limiting. In the second subtask listed above, the contractor used Quantitative Structure Activity Relationships and Quantitative Structure Property Relationships to model sol-gel structures and metal alloy surfaces and their interaction. Metals included were 2000 and 7000 series aluminum and Ti-6Al-4V. In the third subtask, involved an analysis of current Retirement for Cause and Engine Structural Integrity Programs to determine the cost benefits for development of an active refurbishment program to extend useful life of high cost engine components. In the fourth subtask, the research expert investigated vertically integrating p-type GaAs/AlGaAs quantum well infrared photodetector materials with a compatible light emitting diode, by epitaxially growing the two distinct heterostructures on top of each other.

Task Final Report Summary

TASK ORDER: 029 - Assessments

START: 28 Sep 1998

END: 15 Aug 1999

FUNDING (with transfers): \$336,915

EXPENDITURES: \$303,295

NUMBER OF SUBTASKS: 5

OBJECTIVE: To provide assessment of on-going and projected technical programs and technology areas, to assist the guiding of ML investment strategy policy, and to study policy for current and projected AF weapon systems.

LARGEST SUBTASKS:

- a. 029-1 Space SEA Assessments – Anteon, \$108,625
- b. 029-4 Assessment of the AFRL/ML Strategic Plan for Pollution Prevention – Joseph Kolek, \$72,500
- c. 029-2 Technical Assessment of the Strategic Plan for Structures Technology – JSF – Larry Kelly, \$57,000
- d. 023-3 Technical Assessment of the Strategic Plan for Structures Technology - Aging Systems – Robert Bader, \$62,415

SUMMARY: Two of the largest subtasks involved strategic planning support to the Structures Division of the Air Vehicles Directorate. Specifically, they looked at the impact of aging systems and the JSF aircraft on the strategic plan. The third subtask involved identification and prioritization of AF needs and analysis of options and identification of research and development options, which may provide solutions to meet pollution prevention needs. This assessment involved interfacing with other Air Force and DoD agencies, including the Strategic Environmental Research and Development Program (SERDP). The last subtask involved assessment of the Strategic Plan for Space and Missiles in the Materials Directorate. The assessment considered both the technical direction, as well as, business aspects of the program. Government and industry reviews were attended and technical analyses and investment strategies were provided to the Air Force.

Task Final Report Summary

TASK ORDER: 030 – ML Strategic Studies

START: 12 Dec 1997

END: 15 Aug 1999

FUNDING (with transfers): \$834,176

EXPENDITURES: \$776,800

NUMBER OF SUBTASKS: 8

OBJECTIVE: To perform studies on AF customers technology needs and opportunities for technology breakthroughs, changes in political climates, and organizational restructuring needs and to provide analyses to Materials directorate management for their use in deciding strategic directions for research and reorganization in ML, while considering political implications.

LARGEST SUBTASKS:

- a. 030-8 National Defense Authorization Act for the Fiscal Year 1998, Section 912(c) Planning Support and Database Management – Anteon, \$160,000
- b. 030-5 Technical Service in Support of Corporate Investment Strategy – Anteon, \$320,000
- c. 030-6 AFRL/XPT Technical Services – Anteon, \$11,576
- d. 030-1 ML Information Tool – Anteon, \$31,500
- e. 030-0 ML Strategic Studies – Anteon and AdTech, \$302,000

SUMMARY: This task supported several strategic study activities. One activity involved providing analyses and administrative support to AFRL in a study to streamline and improve acquisition organization infrastructure. Another study provided an assessment of R&D performed by other government agencies, industry, and academia to assist AFRL strategic planning and transferring of technology and provided assistance in interfacing with the directorates. A third activity assisted in the collection and editing of information for the AF Science & Technology Plan. Other activities involved an information management tool and an assessment of the SAB report on Expeditionary Air Force.

Task Final Report Summary

TASK ORDER: 031 – Information Collection and Dissemination

START: 9 May 1997

END: 15 Aug 1999

FUNDING (with transfers): \$450,000

EXPENDITURES: \$450,000

NUMBER OF SUBTASKS: 0

OBJECTIVE: To provide a vehicle for MLP-developed technologies to be recognized, accepted, and transitioned.

LARGEST SUBTASKS: N/A

SUMMARY: Under this task, Anteon provided technology transition and transfer activities to the Electro-magnetic Materials Division. Anteon was responsible for maintaining a repository of over 2000 documents with classification to the Secret Level. A computer system was established and maintained to search, collect, retrieve, and share stored information. A system was also established to disseminate classified/reviewed technical reports and papers. Support was also provided to lectures, workshops and working groups on selected topics to disseminate information.

Task Final Report Summary

TASK ORDER: 033 – ML Technology Transition and Transfer

START: 12 Dec 1997

END: 15 Aug 1999

FUNDING (with transfers): \$1,166,900

EXPENDITURES: \$1,159,211

NUMBER OF SUBTASKS: 9

OBJECTIVE: To provide a vehicle for ML developed technologies to be recognized, accepted and transitioned to DoD contractors and transferred to the commercial sector.

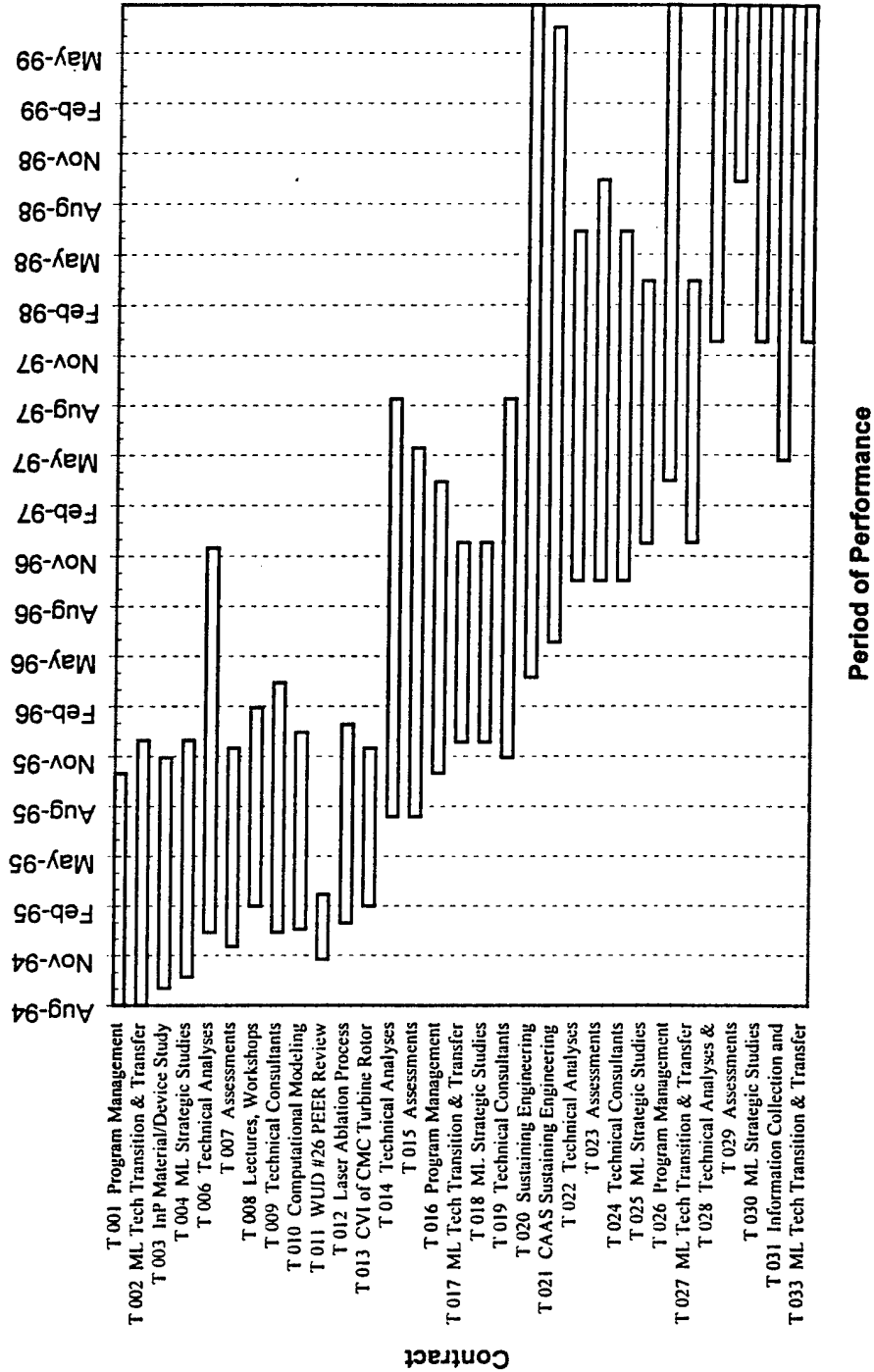
LARGEST SUBTASKS:

- a. 033-7 1998 Materials and Processes for Space Applications Symposium – Anteon, \$120,000 (Net after registration fees of \$50,655)
- b. 033-3 MLLP Technology Transfer – Anteon, \$100,500
- c. 033-6 Information Dissemination (AFRL/XP Public Affairs) – Anteon, \$127,000
- d. 033-2 MLS Technology Transfer – Anteon, \$69,075

SUMMARY: Under this task, Anteon provided technology transition and transfer activities to the Materials Directorate and to the Air Vehicles Directorate's Structures Division. Activities for MLS included development of viewgraphs and displays as necessary. Anteon provided support to the AFRL Public Affairs Office to assist in transitioning technologies. A major activity was the planning and conducting of the 1998 M&P for Space Applications Symposium. This activity was attended by over 300 people. Registration fees of \$50,655 were collected offsetting expenditures on this subtask.

Appendix A

Time Phased Listing of Task Orders



Appendix B

List of All Subtask Efforts and Performers

T/O 001 Program Management - Anteon

T/O 002 ML Technology Transition and Transfer Center

002-1 Technology Transition and Transfer Center - Anteon

002-2 WL/FI Technology Transition - Anteon

T/O 003 Indium Phosphide Materials/Device Correlation Study – Allied Signal

T/O 004 ML Strategic Studies

004-1 Establish & weigh ML objectives, goals and decision criteria and determine constraints and metrics - IBX

004-2 Identify elements and implementation plan for management decisions - Anteon

004-3 2-day workshop on strategic planning strategy - QLSI

004-4 Expansion of Task 2 - Anteon

004-5 Generate & compile data for mathematical algorithm for appraisal system - Anteon

004-6 Decision Analysis - Anteon

T/O 005 Ceramic Fiber Coating Consultations/MLLM CANCELLED

T/O 006 Technical Analyses

006-1 Low Energy Configuration Computer Models of PFPPE Fluids – Allied Signal

006-2 Antenna Window Thermal and Ablation Modeling – Aerostar Technologies

006-3 Equal Channel Angular Extrusion- Texas A&M

006-4 Technical Analysis of Nonequilibrium Coating Technology – Anteon w William Bourne, Robert Knight, Dr. Peter Haaland, Dr. Peter Bletzinger

006-5 NLO & Quasi particle Mobility in Polymers - Analatom

006-6 Technical Analysis of Mechanical Response Data – Dr. D.I.G. Jones

006-7 Develop and apply classical molecular dynamics software for DoD and laser hardened materials science programs – Dr. James Lupo

006-8 MS Development – Honeywell Technical Center

T/O 007 Assessments

007-1 MLBC Technical Assessment - Anteon

007-2 Identification of Candidate Components for Low Cost Induction Heating Process - Boeing

007-3 Medical Applications for Composites – Dr. Roger von Hanwehr & Bill Watt

007-4 Assessment of Strategic Plan for Structures Technology – Robert Bader, Jan Garrison and Larry Kelly

007-5 Assessment of Strategic Plan – Frank Boensch
007-6 Assessment Study of Composite Design Property Needs & Performance
Data for Spacecraft Applications – Applied Materials Technology

T/O 008 Lectures, Workshops and Seminars - Anteon

T/O 009 Technical Consultations

009-1 Analysis and Review of Non-linear Optical Materials - Dr. Paras Prasad
009-2 Technical Consultation for the Installation of Composite Repairs on Metal
Structures – Bud Westerman (Boeing)
009-3 Organic Synthesis of Polyimide Oligomers - Dr. Girish Patil
009-4 Organic Synthesis of NLO – Active Pyridinium Chromophores - Dr. Ram
Kannan
009-5 Measurement of Cryogenic IR Indices for Thin-Film Materials - Dr. Tom
Leonard
009-6 Enterprise Processes - Dr. Linda Detterman

T/O 010 Computational Modeling of Fluorohalocarbon Molecules – Univ of North Texas

T/O 011 WUD #26 PEER Review - Anteon

T/O 012 Laser Ablation Process: Plume Physics – Physical Sciences Inc.

T/O 013 Chemical Vapor Infiltration (CVI) of Ceramic Matrix Composite (CMC)
Turbine Rotor – General Atomics

T/O 014 Technical Analyses

014-1 Technical Analysis of Laser Cleaning of Oxygen Lines – Dr. Craig Walters
& John Lawrence
014-2
014-3
014-4 Characterize optical materials via innovative modeling – Dr. Soumya
Patniak
014-5 Analysis of Fastener Hole Processing – Rockwell Science Center
014-6 Modeling of various nonstructural materials to predict the characteristics of
plasmas formed during Pulsed Laser Deposition – Physical Sciences Inc.
014-7 Extraction of data from quantum mechanical models – Christopher Ehlers
014-8 Extraction of data from quantum mechanical models – North Texas State
014-9 High Velocity Thermal Spray – Weidman Company
014-10 Titanium Alloy Billet Thermomechanical Processing – General Electric
Research
014-11 Optimization of Powders for Large Area Powder Coatings - METSS
014-12
014-13 Ion Implantation on SiC Wafers – Implant Sciences
014-14 User account at Stanford Synchrotron Radiation Laboratory – Stanford
Synchrotron Radiation Laboratory

014-15 Rutherford Backscattering of Ion Implanted Silicon Carbide – Western Reserve University

T/O 015 Assessments

015-1 Technical Assessment of the Strategic Plan for Structures Technology for JSF/FIB – Larry Kelly

015-2 Strategic Plan for Aging Systems – Robert Bader

015-3 Technical Assessment of the Strategic Plan for Structures Technology (Composite Structures) – Jan Garrison

015-4 Technical Assessment of the Strategic Plan for Structures Technology (Extreme Environment) – Frank Boensch

015-5 Technical Assessment of the WL/FIB Fracture Mechanics Strategic Plan – Dr. Frank Adams

015-6 Strategic Plan for the Space and Missile Program Area - Anteon

015-7 Medical Applications for Composite – Dr. Von Hanwehr and Bill Watt

015-8 Consultant Support to WL & FI/FIBA – General Ronald Yates

015-9 Technical Assessment of the WL/FI Strategic Plan – John K. Buckner

015-10 Assessment of the SL/MLS Technology Transfer Requirements - Anteon

T/O 016 Program Management – Anteon

T/O 017 ML Technology Transition and Transfer

017-1 ML Technology Transfer (TIC Center) - Anteon

017-2 AFRL/FIBA Technology Transfer - Anteon

017-3 WL/ML Multi-Media CD ROM Presentation - Paradigm Communications Inc.

017-4 WL/FIVE Brochure - Anteon

T/O 018 ML Strategic Studies

018-1 Requirements Analysis - Anteon

018-2 AFRL/ML Integrated Data Base - Anteon

018-3 AFRL/FMB Integrated Data Base - Anteon

T/O 019 Technical Consultants

019-1 Characterization of Organic Compounds for Nonlinear Optical Properties - Dr. Paras Prasad (SUNY Buffalo)

019-2 Aging Systems Technical Consultations - Dr. Walter Reimann

019-3 Research on Shear-Induced Bond Scission and Molecular Thinning - Dr. Parviz Dadras (WSU), Dr. Hugh Spikes, and Dr. Richard Palmer

019-4 Seminar “Pyrolysis of Wood” - Dr. Dennis Nagle, John Hopkins U

019-5 Seminar “Finite Element Analysis of Frictional Interfaces” - Dr. Kishore Pochiraju

019-6 Seminar “SiC Related Opto-electronic Devices” - Prof. James Kolodzey

019-7 Seminar “Polymerization Mechanism of PBO Polymer” - Dr. So Dow Chem